


AMENDED CLAIMS:

1. (Once amended) A thermoplastic elastomer having A blocks and B blocks and being present in a [substantially] solid state suitable for use as a binder for at least one of a propellant, explosive, and gasifier, the thermoplastic elastomer being formulated from a composition comprising, as constituents:

 A blocks terminated with isocyanate-reactive groups derived from monomers comprising at least one member selected from the group consisting of oxetane derivatives and tetrahydrofuran derivatives, the A blocks being crystalline [at temperatures] below about [75°C] 60°C;

B blocks terminated with isocyanate-reactive groups derived from monomers comprising at least one member selected from the group consisting of oxetane and derivatives thereof, tetrahydrofuran and derivatives thereof, and oxirane and derivatives thereof, the B blocks being amorphous [at temperatures] above about -20°C; and

linking groups derived from at least one diisocyanate for end-capping the A blocks and the B blocks and at least one difunctional oligomer comprising two functional groups which are reactive with isocyanate moieties of the diisocyanate.

3. (Once amended) A thermoplastic elastomer as defined in claim

2, wherein the diisocyanate comprises [toluene diisocyanate] 2,4-toluene diisocyanate.

4. (Once amended) A thermoplastic elastomer as defined in claim

1, wherein the A blocks are crystalline [at temperatures] below about [60°C]

75°C.

31. (New) A thermoplastic elastomer as defined in claim 1, wherein the A blocks have a melting point between about 60°C and about 120°C.

32. (New) A thermoplastic elastomer as defined in claim 4, wherein the A blocks have a melting point between about 75°C and about 100°C.

~~12-33.~~ (New) A thermoplastic elastomer as defined in claim 1, wherein the difunctional oligomer comprises a urethane glycol.


SC 1 34. (New) A thermoplastic elastomer having A blocks and B blocks and being present in a solid state suitable for use as a binder for at least one of a propellant, explosive, and gasifier, the thermoplastic elastomer being formulated from a composition comprising, as constituents:

B3 A blocks terminated with isocyanate-reactive groups derived from monomers comprising at least one member selected from the group consisting of 3,3-(bis(ethoxymethyl)oxetane, 3,3-bis(chloromethyl)oxetane, 3,3-bis(methoxymethyl)oxetane, 3,3-bis(fluoromethyl)oxetane), 3,3-bis(acetoxymethyl)oxetane, 3,3-bis(hydroxymethyl)oxetane, 3,3-bis(methoxyethoxymethyl)oxetane, 3,3-bis(iodomethyl)oxetane, 3,3-bis(nitratomethyl)oxetane), 3,3-bis(methylnitraminomethyl)oxetane, and 3,3-bis(azidomethyl)oxetane);

B blocks terminated with isocyanate-reactive groups derived from monomers comprising at least one member selected from the group consisting of 3-hydroxymethyl-3-methyloxetane, 3-octoxymethyl-3-methyloxetane, 3-chloromethyl-3-methyloxetane, 3-azidomethyl-3-methyloxetane, 3-iodomethyl-3-methyloxetane, 3-propynomethyl-3-methyloxetane, 3-nitratomethyl-3-methyloxetane, 3-methylnitraminomethyl-3-methyloxetane, tetrahydrofuran, glycidyl azide polymer, and poly(glycidyl nitrate); and

linking groups derived from at least one diisocyanate for end-capping the A blocks and the B blocks and at least one difunctional oligomer

comprising two functional groups which are reactive with isocyanate moieties of the diisocyanate.

 14/35. (New) A thermoplastic elastomer as defined in claim 13/
wherein:

the diisocyanate contains a first isocyanate moiety which is at least five times more reactive with the terminal groups of the blocks than a second isocyanate moiety thereof, whereby the more reactive first isocyanate moiety is capable of reacting with and end capping the terminal groups of the blocks, leaving the less reactive second isocyanate moiety free and unreacted; and

the difunctional oligomer has two isocyanate-reactive hydroxyl groups which are sufficiently sterically unhindered to be reactive with the free and unreacted second isocyanate moieties of the end-capped blocks.

15/36. (New) A thermoplastic elastomer as defined in claim 13/
the diisocyanate comprises 2,4-toluene diisocyanate.

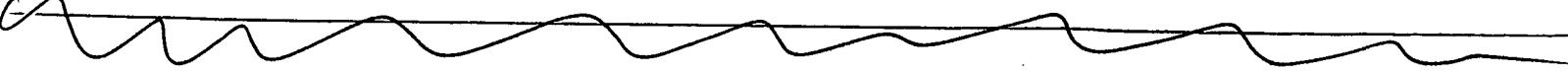
¹¹²
~~37~~. (New) A thermoplastic elastomer as defined in claim ¹³~~34~~, wherein the difunctional oligomer comprises a reaction product of at least one diol and at least one diisocyanate, the diol being selected from the group consisting of ethylene glycol, propylene glycol, butylene glycol, 1,4-cyclohexanedimethanol, and any combination thereof.

BB ¹⁷
~~38~~. (New) A thermoplastic elastomer as defined in claim ¹³~~34~~, wherein the difunctional oligomer comprises a reaction product of at least one diol and at least one diisocyanate, the diisocyanate being selected from the group consisting of hexane diisocyanate, methylene-bis(4-phenyl isocyanate), phenylene diisocyanate, toluene diisocyanate, xylylene diisocyanate, and any combination thereof.

¹⁸
~~39~~. (New) A thermoplastic elastomer as defined in claim ¹³~~34~~, wherein a weight ratio of A to B blocks is between about 15:85 to about 40:60.

¹⁹~~40~~. (New) A thermoplastic elastomer as defined in claim ¹³~~34~~, wherein the isocyanate-reactive terminal groups of the A and B blocks are hydroxyl groups.

²⁰~~41~~. (New) A thermoplastic elastomer as defined in claim ¹³~~34~~, wherein the difunctional oligomer comprises a urethane glycol.



AMENDED CLAIMS:

1. (Once amended) A thermoplastic elastomer having A blocks and B blocks and being present in a solid state suitable for use as a binder for at least one of a propellant, explosive, and gasifier, the thermoplastic elastomer being formulated from a composition comprising, as constituents:

A blocks terminated with isocyanate-reactive groups derived from monomers comprising at least one member selected from the group consisting of oxetane derivatives and tetrahydrofuran derivatives, the A blocks being crystalline below about ⁷⁵~~60~~°C;

B blocks terminated with isocyanate-reactive groups derived from monomers comprising at least one member selected from the group consisting of oxetane and derivatives thereof, tetrahydrofuran and derivatives thereof, and oxirane and derivatives thereof, the B blocks being amorphous above about -20°C; and

linking groups derived from at least one diisocyanate for end-capping the A blocks and the B blocks and at least one difunctional oligomer comprising two functional groups which are reactive with isocyanate moieties of the diisocyanate.

3. (Once amended) A thermoplastic elastomer as defined in claim 2, wherein the diisocyanate comprises 2,4-toluene diisocyanate.

4. (Once amended) A thermoplastic elastomer as defined in claim 1, wherein the A blocks are crystalline below about ⁶⁰75°C.

31. (New) A thermoplastic elastomer as defined in claim 1, wherein the A blocks have a melting point between about 60°C and about 120°C.

32. (New) A thermoplastic elastomer as defined in claim 4, wherein the A blocks have a melting point between about 75°C and about 100°C.

¹²
~~33.~~ (New) A thermoplastic elastomer as defined in claim 1, wherein the difunctional oligomer comprises a urethane glycol.

sub C' >

34. (New) A thermoplastic elastomer having A blocks and B blocks and being present in a solid state suitable for use as a binder for at least one of a propellant, explosive, and gasifier, the thermoplastic elastomer being formulated from a composition comprising, as constituents:

3
B

A blocks terminated with isocyanate-reactive groups derived from monomers comprising at least one member selected from the group consisting of 3,3-bis(ethoxymethyl)oxetane, 3,3-bis(chloromethyl)oxetane, 3,3-bis(methoxymethyl)oxetane, 3,3-bis(fluoromethyl)oxetane), 3,3-bis(acetoxymethyl)oxetane, 3,3-bis(hydroxymethyl)oxetane, 3,3-bis(methoxyethoxymethyl)oxetane, 3,3-bis(iodomethyl)oxetane, 3,3-bis(nitratomethyl)oxetane), 3,3-bis(methylnitraminomethyl)oxetane, and 3,3-bis(azidomethyl)oxetane);

B blocks terminated with isocyanate-reactive groups derived from monomers comprising at least one member selected from the group consisting of 3-hydroxymethyl-3-methyloxetane, 3-octoxymethyl-3-methyloxetane, 3-chloromethyl-3-methyloxetane, 3-azidomethyl-3-methyloxetane, 3-iodomethyl-3-methyloxetane, 3-propynomethylmethyloxetane, 3-nitratomethyl-3-methyloxetane, 3-methylnitraminomethyl-3-methyloxetane, tetrahydrofuran, glycidyl azide polymer, and poly(glycidyl nitrate); and

linking groups derived from at least one diisocyanate for end-capping the A blocks and the B blocks and at least one difunctional oligomer

comprising two functional groups which are reactive with isocyanate moieties of the diisocyanate.

¹⁴
~~35.~~ (New) A thermoplastic elastomer as defined in claim ¹³~~34~~,

wherein:

3
B the diisocyanate contains a first isocyanate moiety which is at least five times more reactive with the terminal groups of the blocks than a second isocyanate moiety thereof, whereby the more reactive first isocyanate moiety is capable of reacting with and end capping the terminal groups of the blocks, leaving the less reactive second isocyanate moiety free and unreacted; and

the difunctional oligomer has two isocyanate-reactive hydroxyl groups which are sufficiently sterically unhindered to be reactive with the free and unreacted second isocyanate moieties of the end-capped blocks.

¹⁵
~~36.~~ (New) A thermoplastic elastomer as defined in claim ¹³~~34~~, wherein the diisocyanate comprises 2,4-toluene diisocyanate.

¹⁶
~~37.~~ (New) A thermoplastic elastomer as defined in claim ¹³~~34~~, wherein the difunctional oligomer comprises a reaction product of at least one diol and at least one diisocyanate, the diol being selected from the group consisting of ethylene glycol, propylene glycol, butylene glycol, 1,4-cyclohexanedimethanol, and any combination thereof.

³
¹⁷
~~38.~~ (New) A thermoplastic elastomer as defined in claim ¹³~~34~~, wherein the difunctional oligomer comprises a reaction product of at least one diol and at least one diisocyanate, the diisocyanate being selected from the group consisting of hexane diisocyanate, methylene-bis(4-phenyl isocyanate), phenylene diisocyanate, toluene diisocyanate, xylylene diisocyanate, and any combination thereof.

¹⁸
~~39.~~ (New) A thermoplastic elastomer as defined in claim ¹³~~34~~, wherein a weight ratio of A to B blocks is between about 15:85 to about 40:60.

¹⁹
~~40.~~ (New) A thermoplastic elastomer as defined in claim ¹³~~34~~, wherein
the isocyanate-reactive terminal groups of the A and B blocks are hydroxyl
groups.

²⁰
~~41.~~ (New) A thermoplastic elastomer as defined in claim ¹³~~34~~, wherein
the difunctional oligomer comprises a urethane glycol.
